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High-voltage direct current (HVDC) systems – Guidebook to the specification and design evaluation of A.C. filters

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE DIRECT CURRENT (HVDC) SYSTEMS – GUIDEBOOK TO THE SPECIFICATION AND DESIGN EVALUATION OF A.C. FILTERS

FOREWORD

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IEC 62001, which is a technical report, has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment.

This technical report cancels and replaces IEC/PAS 62001 published in 2004. This first edition constitutes a technical revision.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
22F/180/DTR	22F/191/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

HIGH-VOLTAGE DIRECT CURRENT (HVDC) SYSTEMS – GUIDEBOOK TO THE SPECIFICATION AND DESIGN EVALUATION OF A.C. FILTERS

1 Scope

This technical report deals with the specification and design evaluation of a.c. side harmonic performance and a.c. side filters for high-voltage direct current (HVDC) schemes. It is intended to be primarily for the use of the utilities and consultants who are responsible for issuing the technical specifications for new HVDC projects and evaluating designs proposed by prospective suppliers.

The scope of this technical report covers a.c. side filtering for the frequency range of interest in terms of harmonic distortion and audible frequency disturbances. It excludes filters designed to be effective in the Power Line Carrier (PLC) and radio interference spectra.

The bulk of the document concentrates on the “conventional” a.c. filter technology and current-source line-commutated HVDC converters. Discussion of the changes entailed by new technologies is treated exclusively in Clause 20. Other unusual applications, such as series filters, which use conventional technology but are only employed in very specific circumstances, are discussed in Clause 13.

The term “technical report” or “report” used in this document is taken to mean the document which defines the overall system requirements for the a.c. filters and the a.c. system environment in which they have to operate. Such a document is normally issued by utilities to the prospective HVDC manufacturers. It also ensures the uniformity of proposals and sets guidelines for the evaluation of bids. The term as used here does not refer to the detailed engineering specifications relating to individual items of equipment, which are prepared by the HVDC manufacturer as a result of the filter design process.

The technical report defines the technical basis for a contract between two parties, who in this document will be referred to as the “customer” and the “contractor”.

- The “customer” is the organisation which is purchasing the HVDC converter station, including the a.c. filters. The term “customer” is taken to cover similar terms which may be used in specifications, such as owner, client, buyer, utility, user, employer and purchaser, and also covers a consultant representing the customer.
- The “contractor” has the overall responsibility for delivery of the HVDC converter station, including the a.c. filters, as a system, and may in turn contract one or more sub-suppliers of individual items of equipment. The term “contractor” is taken to cover similar terms which may be used in specifications, such as manufacturer, or supplier.

Where the context clearly refers to the pre-contract stage of a project, the word “bidder” has been used instead of “contractor”, to indicate a prospective contractor, or tenderer.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60076-6:2007, *Power transformers – Part 6: Reactors*

IEC 60099-4:2004, *Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems*

IEC/TR 61000-3-6, *Electromagnetic compatibility (EMC) – Part 3-6: Limits – Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems*

IEC 61000-4-7, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

IEC 61803:1999, *Determination of power losses in high-voltage direct current (HVDC) converter stations*